

Connecticut, and Block Island, Rhode Island, the deficiencies were 12.53 and 15.61 inches, respectively.

In the Ohio Valley all stations show deficiencies, the average for the district being 6.12 inches below the normal.

In Tennessee there was a slight excess at Knoxville, and marked deficiencies in the western part of the state, being 10.71 inches, at Nashville, and 18.69 inches, at Memphis.

In the lower lake region there is an average excess of about one-half inch, the extreme departures being a deficiency of 8.47 inches, at Rochester, New York, and an excess of 15.30 inches, at Buffalo, New York.

In the extreme northwest, upper Mississippi valley, and upper lake region there is a general deficiency, except at Chicago, Illinois, excess 7.03 inches; Saint Louis, Missouri, excess 7.71 inches; and Milwaukee, Wisconsin, and Dubuque, Iowa, nearly normal.

All stations in the Missouri valley show an excess, the average for the district amounting to 2.06 inches.

On the Pacific coast there were marked deficiencies in the northern and southern districts, while in the middle Pacific coast region the precipitation averaged about normal.

#### NOTES AND EXTRACTS.

The following extract is from the December, 1885, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The month of December has been generally mild and pleasant. Most of the stations reported high temperatures for this season of the year. The cold days of the month were the 6th, 11th, 15th, 27th, and 28th.

The rainfall was below the average over a greater part of the state, and some stations record an inappreciable fall of rain. Trinity, for instance, reported "not enough to measure." In north Alabama there was a slight fall of snow on the 5th and 14th, not enough, however, to cover the ground. Ice and frost occurred frequently during the month, and at times the ground was quite hard frozen.

Some stations reported beautiful sunsets and bright afterglows.

Greensborough furnishes the following items: "We have had the highest and lowest barometer readings for December that have occurred during the several years of my observation, viz., highest, 30.500, lowest, 29.600; range, 0.900."

Trinity states that "the weather for the month of December has been exceptionally fine; not too warm nor too cold. We have had some ice, and a little sprinkle of snow on the 14th. There has been but little rain; some days of misty weather, and once or twice a slight shower. The roads have been better in this country than I ever knew them at this season of the year. The freezes have been light."

Valley Head states that "a gale passed over this place on the night of the 12th. The wind blew at the rate of about fifty miles per hour and continued for several hours. There was no material damage, so far as I know. The rainfall was 1.40 inches. The wind was from the east."

Chattanooga states that "the mean temperature for December was 2° 4 colder, and the total precipitation 2.22 inches less, than the average for the month, while the total movement of wind was two hundred and seventy-six miles greater. The greatest hourly wind-velocity occurred on the 5th, and was thirty-eight miles, blowing from the southwest, which proved also to be the highest velocity occurring during the year. The mean of the minimum temperature was about 5° higher than the average, thus making the month seem warmer than usual, although the actual facts are that it was 2° 4 colder."

Tuscumbia reports for the 20th the following: "To-day, at 12 m., I witnessed a solar halo about 40° in diameter. The sky was overcast with a very thin white cloud, but the sun shone through with some strength. The outer portion of the circle was perfectly white, the centre was of a white milky appearance about 20° in diameter; between these two portions there was a ring of a dark red purplish tint. This halo continued from 12 m. until 4 p. m. At night there was a lunar halo and a corona around Venus."

#### State summary.

Mean temperature, 44° 1; highest temperature, 74°, at Eufaula, on the 9th; lowest temperature, 12°, at Gadsden, on the 6th; range of temperature, 62°; greatest monthly range of temperature, 50°, at Eufaula; least monthly range of temperature, 39°, at Jacksonville; mean daily range, 16° 1; greatest daily range of temperature, 38°, at Gadsden, on the 4th; least daily range of temperature, 0°, at Centre, on the 1st.

Mean depth of rainfall, 2.87 inches; mean daily rainfall, 0.093; greatest depth of monthly rainfall, 6.25 inches, at Gadsden; least depth of monthly rainfall, inappreciable, at Mount View; greatest daily rainfall average for state, 1.90 inches, on the 18th; greatest daily local rainfall, 4.18 inches, at Mobile, on the 6th.

Average number of days on which rain fell, 6; average number of cloudy days, 9; average number of fair days, 8; average number of clear days, 14; warmest days, 4th and 8th; coldest days, 6th, 11th, 15th, 27th, 28th.

Prevailing direction of wind, northwest.

The following letter has been received from Mr. Ellwood Cooper, of Santa Barbara, Santa Barbara county, California:

SANTA BARBARA, December 12, 1885.

Brig. Gen'l HAZEN, Washington:

DEAR SIR: My last report to your department was partially published in the WEATHER REVIEW of April, 1884. That report gave the rainfall from 1870 to, and including, that of the winter of 1883-'84. The rainfall of 1884 and 1885 was 12.56 inches, 9.12 inches falling from October 8th to December 31st, and 3.86 falling from January 1st to May.

From my letter containing the information given in the report, as stated above, I laid down the theory that during the winters when we had heavy rains before January 1st we were likely to have light rains after January 1st. In support of this I called your attention to the winters of 1871-'72, 1878-'79, and 1880-'81; I have now to add the rainfall of the past winter, demonstrating the same condition as the three winters above alluded to. I also wrote in said communication that during the spring of 1884 we had a series of warm south winds, which caused the unprecedented rainfall of that season, and that since my sojourn in the country, from 1870 down to that time, that the wind had not blown one single hour steadily from that quarter. In my theories there laid down and (?) the statement that by close observation we could, to a certain extent, foretell the probable rainfall each winter.

I now beg to call your attention to the storm of November last, commencing the 15th and ending the night of the 24th. (I was not at home, or I should have reported earlier.) There is no record of so much rain falling in any year, since records have been kept, in the month of November. I have learned from my wife and the men working on the ranch that a very warm wind blew from the southeast (more southerly than easterly), and part of the time due south, the wind on two different days and nights amounting to a gale; many of my fruit trees were uprooted, some broken square off above the ground. This storm commenced apparently without any preparation. In Los Angeles county, twenty miles from the sea, there were no violent winds. I am therefore convinced that there must have been a strong wind blowing from the Gulf of California some time previous to the commencement of the storm here.

Our usual southeast storms cross the country north of Fort Yuma, giving at San Diego about one-third as much rain as at Santa Barbara. The storm of November just passed, the greatest amount of rain was condensed between the first and second ranges of mountains; at the base of the Sierra Madre there were 7 inches of rainfall; at Newhall, 9 inches; in the Ajai Valley, 15; in the Santa Inez Valley, back of Santa Barbara, 19; and at San Luis Obispo, 22 to 24 inches. On the night of the 17th 9 inches of rain fell in a few hours at the latter place. In the town of Los Angeles, 6 inches; Santa Barbara, 9 inches; at Ellwood (my home), 10 inches; at the south base of the Santa Inez range, Glen Annie, there were 14 inches, while at the base on the north side there were 19 inches. This warm wind blowing from the mouth of the Gulf of California was kept westward of the high range on the peninsula and carried directly over the first ranges from San Pedro to Point Conception; on reaching the second ranges, was met by the cold northwest trades, condensed, and hence the greatest precipitation in the valleys back from the coast. In the Paso Robles country there was not much rain, probably, from the reports, about 4 inches. We have had up to date since October 15th, 10.87 inches of rain, and according to my theory we must not expect very much more after January 1st. I do not predict, but the fact that every winter since 1870 that gave us 8 inches or more before January 1st, gave us but little after January 1st. This very strong probability should put farmers and fruit growers on their guard, and they should lose no time in preparing for such an alternative.

I have the honor to be your obedient servant,

ELLWOOD COOPER.

Since the receipt of the above, Mr. Cooper has furnished the following summary:

The review of the rainfall from 1870 to date, establishes thus far one unvarying rule, and that is, that in all our rain seasons, when there has been more than half our winter average of rain before January 1st, we have had less after January 1st, in the ratio or proportion as the amount before was greater. For example:

Season.	Before January 1.	After January 1.	Total.
	Inches.	Inches.	Inches.
1871-'72 .....	8.50	7.44	15.88
1872-'73 .....	8.12	6.38	14.50
1880-'81 .....	13.50	3.06	16.56
1884-'85 .....	9.12	3.44	12.56
1885 .....	13.44		

While I do not pretend to know, or to predict, how much more rain we will have before the end of spring, the above table should warn every farmer and fruit-grower of the necessity of preparing their work with the expectation of having but little more. The season thus far for the cultivator is the best we had in sixteen years, and any failure in crops will be the result of neglect on the part of the farmer.

SANTA BARBARA, December 31, 1885.

The following meteorological summary and accompanying remarks are from the December, 1885, report of the "Indiana

Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly mean.	
Northern counties .....	60.0	- 8.0	29.21	2.56
Central counties .....	59.0	-10.0	31.26	2.38
Southern counties .....	62.0	0.0	34.24	2.70
State.....	62.0	-10.0	31.57	2.55

The mean temperature of the state for December, 1885, was 0°.8 above the mean of the state for the past three Decembers; 1°.47 below the mean of fourteen years at Indianapolis; 3°.65 above the mean of twenty-six years at Logansport; 2°.08 below the mean of twenty-one years at Vevay; 2°.27 above the mean of thirty-two years at Spiceland; 5°.76 above the mean of six years at Maury; 1°.83 below the mean of eight years at Blue Lick; 0°.08 above the mean of four years at Worthington, and 4°.27 above the mean of six years at this station. With the exception of Indianapolis, the mean temperature at the various stations was above the normal, the amounts ranging from 1° to 6°.2.

The mean precipitation for the state is 1.66 inches below the mean for the past three Decembers; 0.76 inch below the mean of fourteen years at Indianapolis; 1.68 inches below the mean of twenty-one years at Vevay; 0.89 inch above the mean of twenty-six years at Logansport; 0.88 inch below the mean of twenty-six years at Spiceland; 1.74 inches below the mean of four years at Blue Lick; 0.58 inch below the mean of four years at Worthington; and 0.64 inch below the mean of six years at this station. With two exceptions, the precipitation at the various stations is below the normal, the amounts ranging from 0.5 to 2.2 inches.

High winds prevailed in all parts of the state between the warm weather of the 4th and the cold wave of the 7th.

The following is the "Iowa Weather Bulletin" for December, 1885, prepared by Dr. Gustavus Hinrichs, director of the State Weather Service:

December, 1885, was very moderate, with excess of precipitation, westerly winds prevailing.

The mean temperature of the air was one and a half degrees above the normal. The first two decades were cold, averaging six degrees below normal, with three very cold groups of three days each, namely, the 9-11th and 12-14th, averaging fifteen degrees below normal, and the 5-7th, averaging eighteen degrees below normal. The last decade was decidedly warmer, being fifteen degrees above normal, and having two three-day groups, the 21st-23d, 28-30th, which were twenty degrees above normal, corresponding to the normal temperature at the beginning of April.

Cloudiness averaged normal for the month, but was in excess during the first and third decades, and much below normal during the middle decade, which was marked by many sunny days, with remarkably high insolation. This decade also comprised the sleighing season. The seven days, from the 15th to the 21st, were as fine winter days as can be experienced anywhere.

Precipitation was nearly fifty per cent. in excess of normal. The principal snow fell on the 9th, and gave fair sleighing, which lasted until about the 21st. The four days from the 27th were rainy and cloudy, and gave over one inch of water in many places.

No remarkable phenomena were noted. Silver thaw on the 18th; fog on the 17th and 29th. The only high northwest wind began on the 4th and continued into the 5th. The total run of the wind for the month was nearly normal. The number of days on which the temperature reached to, or fell below, zero (Fahrenheit) was six, one less than normal.

December, 1885.	Temperature.		Rainfall.
	Mean.	Departure.	
First decade.....	19.5	- 6.8	0.54
Second decade .....	18.2	- 5.0	0.24
Third decade.....	35.3	+15.1	1.30
Month .....	24.7	+ 1.6	2.83

The following is an extract from a meteorological summary for 1885, furnished by Prof. F. H. Snow, of the University of Kansas, Lawrence, Kansas:

The chief meteorological peculiarities of the year 1885 were the low temperature of all its months, except November and December; the ample and remarkably well-distributed rainfall; the low aggregate velocity of the wind for every month but August, and the most extraordinary daily wind-velocity on our record (December 4th).

**Temperature.**—The mean temperature for the year, 51°.01, which is 2°.28

below the mean of the seventeen preceding years; the highest temperature was 96°, on July 16th; the lowest was -14°.5, on the 10th of February, giving a range of 110°.5. The mean temperature of the winter months, 24°.04, which is 5°.47 below the average winter temperature; of the spring, 52°.41, which is 1°.27 below the average; of the summer, 74°.28, which is 1°.64, below the average; of the autumn, 53°.33, which is 0°.43 below the average. The coldest month of the year was January, with mean temperature 18°.74; the coldest week was January 15th to 21st, mean temperature, 1°.68; the coldest day was February 10th, mean temperature, -4°.12. The mercury fell below zero on twenty-one days, of which thirteen were in January, seven in February, and one in December. The warmest month was July, with mean temperature, 77°.06; the warmest week was July 18th to 24th, mean, 81°.66; the warmest day was July 15th, mean, 84°.75. The mercury reached or exceeded 90° on twenty-seven days (fourteen less than the average number), viz., three in June, seventeen in July, and seven in August. The last hoar frost of spring was on May 8th, the first hoar frost of autumn was on October 4th, giving an interval of one hundred and forty-nine days, or nearly five months, entirely without frost; the average interval is one hundred and fifty-five days. The last severe frost of spring was on April 13th; the first severe frost of autumn was on October 6th, giving an interval of one hundred and seventy-six days, or nearly six months, without severe frost; the average interval is one hundred and ninety-nine days; no frost during the year caused damage to crops of grain or fruit, but the low temperatures of January and February were generally destructive to peach buds.

**Rain.**—The entire rainfall, including melted snow, was 36.97 inches, which is 1.79 inches above the annual average; either rain or snow, or both, in measurable quantities, fell on one hundred and three days—one less than the average; on twenty other days rain or snow fell in quantities too small for measurement. There was no approach to drought during the year, the longest interval without rain in the growing season being ten days, from August 12th to 23d. The number of thunder showers was thirty-one; there were two light hail storms during the year.

**Snow.**—The entire depth of snow was 83 inches, which is 12.13 inches above the average; of this amount, 8 inches fell in January, 11 inches in February, 4 inches in March, and 10 inches in December; snow fell on twenty-seven days; the last snow of spring was on March 27th; the first snow of autumn was on November 12th—four days later than the average date.

The mean cloudiness of the year was 44.57 per cent., which is 0.08 per cent. below the average.

The prevailing direction of the wind was southwest.

The average atmospheric humidity for the year was 71.3; the dampest month was January, with the mean humidity 83.0; the driest month was November, mean humidity, 65.0.

The following is an extract from the December, 1885, report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Carleton College, Northfield:

The average mean temperature of Minnesota for December, as deduced from reports from seventeen stations of the Minnesota Weather Service, is 19°.5. This is 12°.6 colder than the preceding month of November, but much above the average for the month. The warmest station was La Crosse, with a mean for the month of 26°.3; the next warmest was Winona, 23°.5. The coldest stations were Saint Vincent, Park Rapids, and Moorhead, 11°.6, 14°.0, and 15°.3, respectively. The highest temperature, with few exceptions, occurred on the 22d. High temperatures recorded were: Grand Forks, 45°.0, 2d; Crookston, 45°.0, 28th; Winona, 54°.0, 22d, and Park Rapids, 43°.1, on the 27th. The minimum temperatures, as in November, were very high, as compared with the usual greatest cold for the month, being, with but one exception, above -20°.5. The effect of this comparative evenness was to cause the month to be marked by delightful weather throughout all parts of the north-west. The observer at Grand Forks, in the Upper Red River Valley, under date of the 26th, says: "The last fifteen days have been exceptionally mild for the season. The weather has been clear, and the temperature, under the influence of the prevailing light southwest winds, has, upon nearly every day, been above the freezing point."

Though several Decembers since 1870 have been materially warmer than the present, yet December, like November, has been a warm month, the mean temperature for the month being much above the average of the last fifteen years. The mild weather of the last November was carried into December, until the 4th, when the equilibrium of the air was disturbed by a storm-centre, or area of low pressure, which rapidly advanced from the Northwest Territory during the 3d and 4th and passed to the Saint Lawrence Valley on the 5th. The contrasts in the weight of the air were very great during the passage of this low area over the state, thereby causing heavy gales and stormy weather, and a cold wave which extended to all sections. Wind-velocities were noted, as follows: Northfield, north, forty-six miles per hour; Bird Island, northwest, forty-six miles per hour.

From the 5th to the 15th the weather was cold, but not unseasonably so, and the minimum temperatures of the month were generally registered during this period. On the 15th the weather began to grow warmer, and from that date to the end of the month the weather was continually mild, with thaws on many days, so much so that the snow disappeared; and the ice in the rivers, which were generally closed on the 5th, was covered with water, and a break-up seemed imminent. There was an unusual number of foggy days, and on the 22d, 26th, 27th, 28th, and 29th rain was noted in various localities.

The snowfall for the month was generally small, the most of it occurring on

the 4th and 8th. On the 15th there were from six inches on the ground, in the southeast, to three inches, in the northwest; but this generally disappeared by the 22d, leaving the ground bare, much to the detriment of the logging and other interests which depend on an abundance of snow, and at the end of the month prospects were discouraging for a full cut in the lumbering districts. But two stations, Winona and La Crosse, report more than one inch of precipitation; 1.93 and 1.79 inches, respectively.

The following is an extract from the December, 1885, report of the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Washington University, Saint Louis:

December has been somewhat warmer than the normal (about 2°) and has a deficiency of rainfall of about 1 inch.

The mean temperature of the first decade was 30° and that of the second 32°.5, both being slightly below normal December weather. The third decade was about 43°.1, or about 10° above the normal.

The lowest temperature reached was 4°, on the 14th. The minimum temperature fell below 32° on thirteen days, and on eight days it did not rise above 32°. The highest temperature reached was 60°.8.

The rainfall was about equally divided among the three decades, falling as snow during the first two.

In the state the rain was less than one inch in the north part of the state and in the region drained by the Osage River, and increases to over three inches in a small region south of Saint Louis.

The lowest temperatures reported are, Chamois, -11°; Mascoutah, -10°; and Mexico, -7°. The highest temperatures are, Chamois, 72°, and Steelville, 65°.

A heavy wind on the 4th, which was felt in the northwest part of the state in the early morning and at 7 o'clock at Glasgow, reached Chamois at 9 o'clock and arrived at Saint Louis about 4 p. m. It was strong enough to overthrow old buildings and to unroof houses, and did extensive damage. It was attended with a marked fall of temperature.

Chamois reports the month as 2° above the average of the last ten years.

The following is an extract from the December, 1885, "Bulletin of the New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, Rhode Island:

Reports for the month were received from one hundred and thirty-five observers.

**General conditions.**—The month was warm, with a large number of fair days, and a deficiency of rain and snow.

**Precipitation.**—The amount and distribution of the precipitation were very irregular. There was also great variability in its character, whether rain or snow. In the northern portion there was considerable snow, but in the southern portion little or no snow fell during the month. Throughout the district the snowfall was less than the usual amount in December.

**Temperature.**—With few exceptions the temperature was above the average at stations where a comparison with former records can be made. There was also an absence of extremely low temperature, only a few readings below zero having been reported. In this respect the month differed widely from December, 1884, in which nearly every station reported temperatures below zero, on the 20th.

**Pressure.**—Ten depressions, with the usual attendant conditions, passed in the vicinity of the district, all moving rapidly. Seven of these moved in the usual path from the Lakes down the Saint Lawrence Valley; one (13th-15th) from the Ohio Valley down the Saint Lawrence; and two (26th-27th and 31st) up the Atlantic, east of the coast. Two in the first class were secondary depressions, which formed out of the same conditions as earlier depressions, and immediately followed in their track. The highest pressure of the month was about 30.7 inches, on the 12th.

**Wind.**—High westerly winds attended the advance of a wave of high pressure (30.3 inches) on the 7th, and very severe gales were experienced on the coast on the 26th and 27th, in connection with the depression moving up the Atlantic on those dates. The tide was high, and much damage was done to vessels and in the coast towns.

**Miscellaneous.**—Auroras were generally noted on the 1st, 6th, and 7th; on the 4th, at Saint John; on the 8th, at Belfast and Walpole; and on the 9th, at Kent's Hill.

Lightning and thunder were noted as follows: 3d, South Hingham, lightning in southeast in evening; Kent's Hill, 10.30 p. m., lightning flash in east, below horizon; 6th, Nantucket, sharp lightning in evening; South Hingham, lightning in evening in southeast and south; 19th New Bedford, thunder and lightning in morning, during rain storm; Nantucket, thunder, 8.20-11.10 a. m., with wind squall, during rain storm.

#### The year 1885.

The meteorological conditions of the year were especially favorable for agriculture. There was little damage from late frosts in the spring, or from early frosts in the fall, and the rainfall was abundant. The season was about normal in time, from spring to autumn.

The precipitation record shows an average deficiency over that of previous years, but there are marked irregularities. It is quite probable that some of these irregularities arise from the fact that the records were made under different conditions in different years. This is one of the most fruitful sources of error in combining precipitation records, and seriously impairs the value of

comparative tables. There were many instances of excessive rainfall in individual storms, especially in July and August.

In the early part of the year, there occurred a period of almost unprecedented cold, lasting from the middle of January to the end of March. The spring and summer were somewhat below the average temperature, and autumn above it, giving a decided deficiency for the year.

The thunder-storms of the summer were numerous and severe. Lightning also attended a few of the general storms of the winter. Severe gales were noted in several months, those in the last three months of the year having caused considerable damage on the coast.

The following is an extract from the December, 1885, report of the "Ohio Meteorological Bureau," under direction of Prof. Benjamin F. Thomas, of the Ohio State University, at Columbus:

A comparison of the reports for December, 1885, with those for the same month in the three preceding years shows that the principal differences were experienced in the atmospheric pressure, temperature, and precipitation.

The mean pressure was 0.37 inch lower than the lowest of the years named, and 0.46 lower than their mean. The lowest pressure was 29.118, on the 4th, the lowest shown by the records of the bureau. This low pressure marked the beginning of the severest storm of the month.

The mean temperature, 32°.4, was 1°.8 above the mean of the three years preceding, and 0°.37 above the normal. The extreme range of the temperature from 6°.8, on the 7th, to 71°.0, on the 9th, accompanied the storm alluded to above.

The mean rainfall reported was 1.76 inches, the least on our records for December, and 1.48 inches, or forty-six per cent., below the normal. The low pressure and somewhat high temperature prevailing would lead one to expect a rainfall above the average, and an examination of the relation between pressure, temperature, and precipitation for each of the three preceding years would confirm the expectation. The month's record is in this respect exceptional.

#### State summary.

**Atmospheric pressure.**—Mean for the state, 30.10; highest, 30.78, on the 12th, at Canton; lowest, 29.11, on the 4th, at Wauseon; range for the state, 1.66.

**Temperature.**—Mean for the state, 32°.4; highest, 71°, on the 9th, at Hanging Rock; lowest, -6°.8, on the 7th, at Wauseon; range for the state, 77°.8; mean daily range, 16°.6; greatest daily range, 49°.4, at Oberlin; least daily range, 1°.0, on the 31st, at Logan.

**Relative humidity.**—Mean for the state, 79.8 per cent.

**Precipitation.**—Average for the state, 1.74; average daily, 0.057; greatest monthly, 2.97, at New Alexandria; least monthly, 0.50, at Ainger.

Average number of clear days, 5.1; fair days, 9.7; cloudy days, 16.2; on which rain fell, 12.5; greatest number of days on which rain fell, 20, at Sandusky; least number of days on which rain fell, 5, at Springborough.

Prevailing direction of the wind, southwest.

The following is an extract from the Tennessee "State Board of Health Bulletin," for December, 1885, prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health. The summary is prepared by Major H. O. Bate, in charge of the State Meteorological Service:

The weather during the month of December was, for the most part, remarkably mild and pleasant, with but few special features, the principal being the high winds which prevailed during the first week.

The mean temperature was 39°.41, only 0°.27 above that for December, 1884, and 3°.46 below that for December, 1883. The maximum temperature, recorded about the 4-9th, was the same as the December maximum of 1884, and 6° below that of 1883. The minimum temperature, recorded about the 15th, was the same as that of 1883, and 13° above the December minimum of 1884.

The average rainfall was 3.19 inches, 2.13 inches less than the December average for the year previous, and 1.12 inches less than that for 1883. As during the past three months, the eastern division of the state received the largest portion, averaging nearly four inches. The middle division received but little over three inches, while the western division received only two and three-fourths inches. The rains of the 9th and 18th were quite heavy, especially in the eastern division. The greatest local daily fall was 2.80 inches, reported on the 9th, at Andersonville. The days of the greatest rainfall were the 1st, 8th, 9th, 13th, 23d, 30th, and of these the greatest fall occurred on the 9th. These, together with the 12th, were general rains. No rain was reported on the 16th, 17th, 19th, 20th, 21st and 26th.

There were only three or four slight falls of snow during the month, scarcely sufficient to measure. They occurred on the 5th, 14th, and 25th, in the eastern division; the 5th and 14th, in the middle division; and the 5th and 18th, in the western division. The greatest depth reported was 0.90 inch, at Farmingdale.

#### State summary, December, 1885.

Mean temperature, 39°.41; highest temperature, 72°, on the 9th, at Jonesborough; lowest temperature, 12°, on the 15th, at Fostoria and Trenton; range of temperature, 60°; mean monthly range of temperature, 46°.97; greatest monthly range of temperature, 58°, at Fostoria; least monthly range of temperature, 38°, at Greenville; mean daily range of temperature, 15°.75; greatest daily range of temperature, 50°, on the 11th, at Fostoria; least daily range of

temperature, 2°, on the 1st, at Greeneville and Rogersville; on the 8th, at Howell; on the 9th, at Lexington; on the 10th, at Cookeville; on the 13th, at Parkersville, and on the 21st, at Hurricane Switch; mean of maximum temperatures, 64°.84; mean of minimum temperatures, 17°.37.

Mean depth of rainfall, 3.19 inches; mean daily rainfall, 0.103 inch; greatest rainfall, 5.03 inches, at Andersonville; least rainfall, 1.46 inches, at Greeneville; greatest local daily rainfall, 2.80 inches, on the 9th, at Andersonville; days of greatest rainfall, 1st, 8th, 9th, 13th, 23d, 30th; day of greatest rainfall, 9th.

Average number of days on which rain fell, 7.2; average number of clear days, 9.6; average number of fair days, 11.7; average number of cloudy days, 9.8; average snowfall, 0.19 inch; greatest snowfall, 0.90 inch, at Farmingdale; rainless days, 16th, 17th, 19th, 20th, 21st, 26th; warmest days, 4th, 9th; coldest days, 11th, 15th, 27th.

Prevailing wind, northwest.

#### Annual summary, 1885.

A comparison of the annual summary with those of the two preceding years shows the mean temperature for the past year to be slightly below the means for those two years. The maximum temperature recorded, 102°, was 3° above that for 1884 and 4° above that for 1883. The recorded minimum, —4°, was 14° below that for 1884. The actual minimum temperature for 1883 is not included in the summary for that year, as the observations of temperature did not begin until April.

The average rainfall is shown to be 11.21 inches less than the average for 1884, and only 1.93 inches more than the average of 1883, in which January is not included, and February only partially. For the past year Andersonville reports the greatest total rainfall, 59.26 inches, and Florence Station the least, 39.27 inches; these are from complete reports. The total rainfall at Covington for eleven months, November not being included, was 27.55 inches, which would make that station show the least rainfall, allowing even a liberal estimate for the month omitted. These gaps in the annual summaries, and the consequent difficulty in reaching actual estimates are much to be regretted, and should impress upon observers the great necessity and value of an unbroken record of their individual observations. Nashville shows the greatest total of rainy days, recording one hundred and sixty-one. January was the month of the greatest rainfall, having an average of 6.96 inches, and August the least, or 2.80 inches.

During the past month the percentages of verifications of the temperature and weather predictions, according to the signals adopted by the state board of health, displayed daily from the signal office in this city, were as follows: Temperature; 90.3 per cent.; weather, 93.5 per cent. During November and December, for forty-two consecutive days, the predictions, as displayed by the flags, were fully verified.

Prof. J. A. Laughlin, voluntary observer at Hurricane Switch, Maury county, contributes the following annual data from his station: Average temperature, 55°.4; maximum temperature, 95°.5; minimum temperature, 1°.9; range of temperature, 93°.6; total rainfall, in inches, 40.85; number of days on which rain fell, 110; total fall of snow, in inches, 6.3; number of days on which snow fell, 14; number of fogs, 27; number of hails, 3; number of dews, 122; number of frosts, 72; number of clear days, 108; number of fair days, 130; number of cloudy days, 132; prevailing direction of wind, southwest.

The same observer contributes the following valuable data, the result of his observations, showing the value of solar and lunar halos and coronæ as indications of coming rain or snow. "During the year 1884 and 1885 nineteen solar and thirty-one lunar halos were observed. Of these, thirteen were followed by rain or snow on the same day, twenty-six on the first day after, twenty-six on the second day after, eighteen on the third day after, while seven were followed by no rain or snow. That is, 86 per cent. of the number of halos were followed by rain or snow within three days after they were seen. During the same time fourteen coronæ were recorded, thirteen, or about 93 per cent., of which were followed by the expected weather within three days."

Mean temperature for the state, 56°; highest temperature, 102°, August 9th, at Sailor's Rest; lowest temperature, —4°, February 11th, at Sunbright; range of temperature, 106°; mean daily range of temperature, 15°.92; greatest daily range of temperature, 50°, December 11th, at Fostoria; least daily range of temperature, 1°; January 6th, at Bolivar; 24th, at McKenzie and Trenton; February 8th, at Trenton and Sweetwater; 15th, at Grassy Cove; 16th, at Bolivar; 24th, at Savannah and Henderson; 26th, at Sweetwater; March 1st, at Andersonville; 12th, at Cookeville; 15th, at Sweetwater; 22d, at Hardison's Mills and Pulaski; November 19th, at Riddleton, Florence Station, and Howell.

Number of clear days, 121.4; number of fair days, 117.1; number of cloudy days, 126.5; number of days on which rain fell, 109.5; mean number of clear days per month, 10.1; mean number of fair days per month, 10; mean number of cloudy days per month, 10.5; mean number of days on which rain fell per month, 9.1; greatest number of days on which rain fell at any one station, 151, at Nashville; least number of days on which rain fell at any one station, 72, at Bolivar.

Total average rainfall, 44.36 inches; average monthly rainfall, 3.70 inches; greatest average monthly rainfall, 6.96 inches, in January; least average monthly rainfall, 2.80 inches, in August; greatest yearly rainfall at any sta-

tion, 59.26 inches, at Andersonville; least yearly rainfall at any station, 39.27 inches, at Florence Station; greatest monthly snowfall, 12 inches, in March, at Milan.

The prevailing winds, northwest and southwest.

Table of comparison of the years 1883, 1884, 1885.

	1883.	1884.	1885.
Mean temperature.....	61°	57°.35	56°
Highest temperature.....	98°.0	98°.0	102°.0
Lowest temperature.....	10°.0	—10°.0	—4°.0
Range of temperature.....	88°	11°	106°
Mean daily range of temperature.....	17°	18°	15°.92
Greatest daily range of temperature.....	45°.0	49°.0	50°.0
Least daily range of temperature.....	1°.0	1°.0	1°.0
Number of clear days.....	107	117	121.4
Number of fair days.....	84	105	117.1
Number of cloudy days.....	115	144	126.5
Number of days on which rain fell.....	80	108	109.5
Mean rainfall.....	42.43	55.57	44.36
Average daily rainfall.....	0.138	0.152	0.121
Greatest rainfall.....	54.02	69.24	59.26
Least rainfall.....	30.81	44.50	39.27
Mean number of clear days per month.....	10.7	9.7	10.1
Mean number of fair days per month.....	8.4	8.7	10
Mean number of cloudy days per month.....	11.5	12	10.5
Mean number of days on which rain fell.....	8	9	9.1
Mean monthly rainfall.....	4.24	4.63	3.70
Prevailing direction of wind.....	n. and sw.	n. and sw.	n. and sw.

a July 27th; August 23d. b November 17th. c December 11th. d July 4th, 6th, 14th, 15th, 30th; October 3d, 18th, 21st, 22d, 24th; November 11th, 22d, 25th. e At Bolivar. f At Greeneville. g July 4th, 9th; August 29th; October 3d. h January 6th. i October 19th. j January 2d, 15th, 24th; February 7th, 8th, 14th, 27th; March 13th; April 10th, 12th, 14th, 22d, 23d, 28th; May 8th, 25th, 26th; June 3d, 10th, 11th; July 26th, 30th; September 17th, 25th; October 9th, 27th; November 19th, 28th; December 5th, 12th, 13th, 15th, 21st, 28th, 29th, 30th. k At Riddleton. l At Greeneville. m August 9th. n February 11th. o December 11th. p January 6th, 24th; February 8th, 15th, 16th, 24th, 26th; March 1st, 12th, 15th, 22d; November 19th. r At Andersonville. s At Florence Station.

The following meteorological summary and accompanying remarks are from the December, 1885, report of the "Indiana Weather Service," under direction of Prof. W. H. Ragan, of De Pauw University, Greencastle:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
Northern counties.....	60.0	—10.0	28.9	3.32
Central counties.....	56.0	—10.0	31.3	2.70
Southern counties.....	62.0	—2.0	34.6	2.59
State.....	62.0	—10.0	31.6	2.87

The barometer fluctuations were numerous and rapid, but not generally of great force, during the month. The lowest reading of the year occurred on the 9th. A low of considerable force, from northwest, which curved to northeast across the north end of the state on the afternoon of the 4th, and the cold wave that followed on the 7th were the most remarkable features of the month's weather. Thunder-storms occurred at some central stations in connection with a low, passing from south to north, central at the time in Missouri, on the evening of the 8th.

There were no pronounced cold waves. The nights were moderate, and the range of temperature small. The average minimum, at Greencastle, was 25°.0, against 20°.5 same month last year; range 56°.9, against 73°.8. The average was 2°.8 above normal at Logansport, 1°.5 above at Spiceland, 0°.5 below at Indianapolis, 2°.3 above at Vevay, 6°.4 above at Maury, 1°.3 above at Worthington, 1°.9 above at Blue Lick; and for the state, 0°.6 above 1882, 2°.1 below 1883, 3°.0 above 1884, 0°.4 above the mean for four years. For the year the mean was 2°.0 below normal at Logansport, 0°.1 below at Spiceland, 3°.4 below at Indianapolis, 2°.1 below at Vevay; and for the state, 1°.2 below 1883, 2°.6 below 1884, 1°.3 below normal.

The precipitation was well distributed through the month and over the state. Principal falls occurred on the 8th to 9th, 13th, 23d, 29th to 30th. No rain fell on the 2d, 2d, 15th, 16th, 19th, 20th. Snow is reported on seventeen days in the north, fourteen in the centre, and nine in the south; rain or snow at one or more stations on twenty-four days.

The Chief Signal Officer has received the "Monthly Bulletin of the Commissioner of Immigration for Dakota" for December, 1885, prepared under the direction of Lauren Dunlap, esq., at Huron. The report contains a very complete and interesting meteorological summary of the "Dakota Weather Service" for November, 1885.